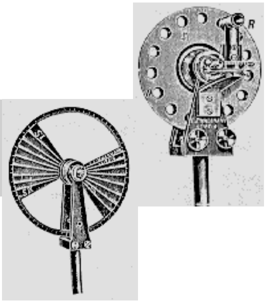
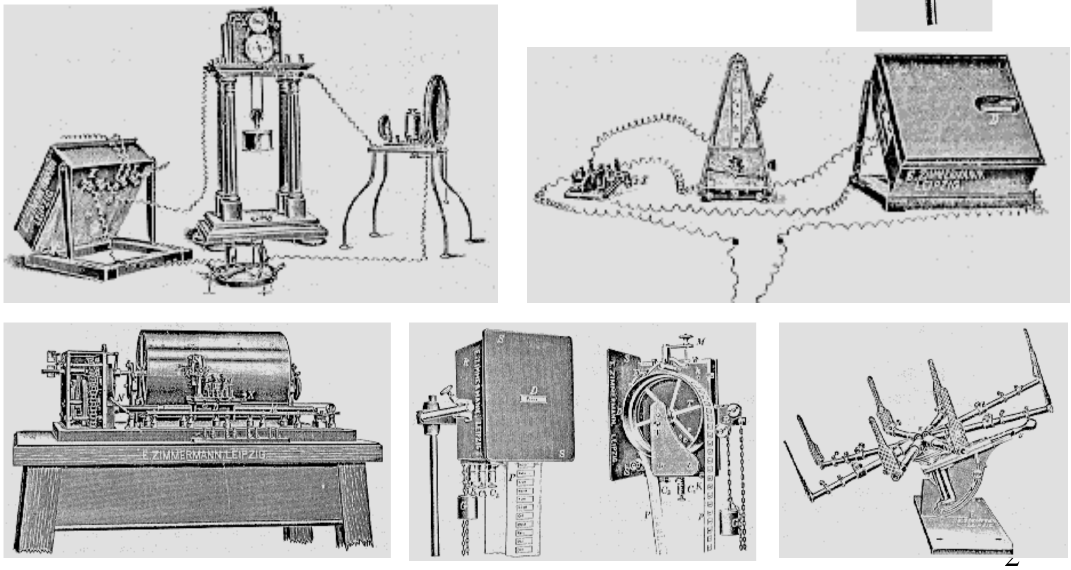
Announcements

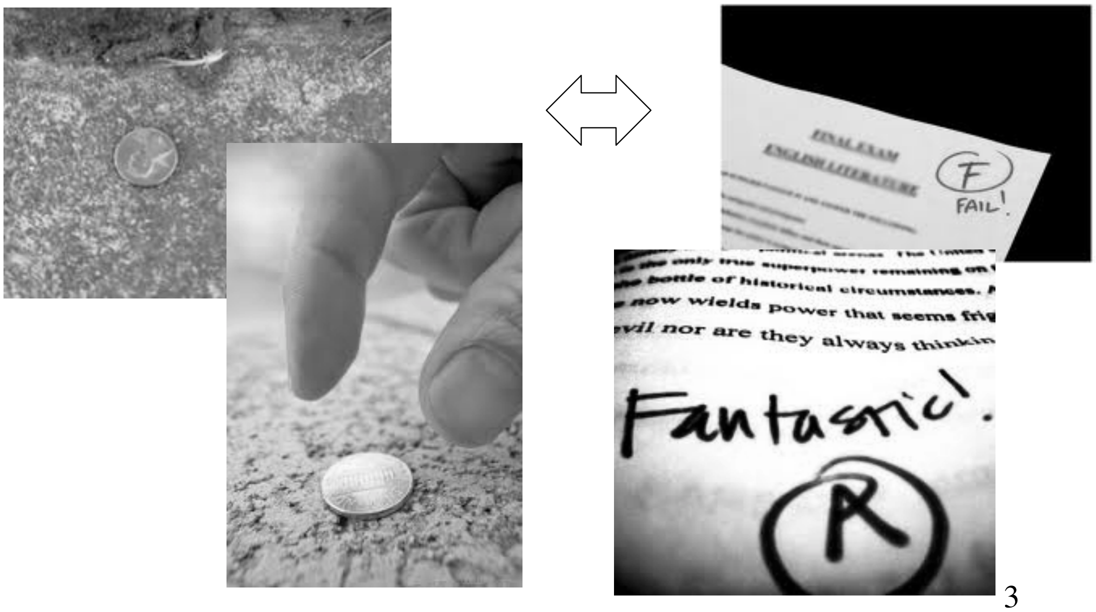
- First quiz due next Tuesday
- 290 recruiting fair Tuesday 4-6
  - atrium of Psychology Building

Methods and Theories





Observational study



OBSERVATION

measure two (or more) things and look for a relationship

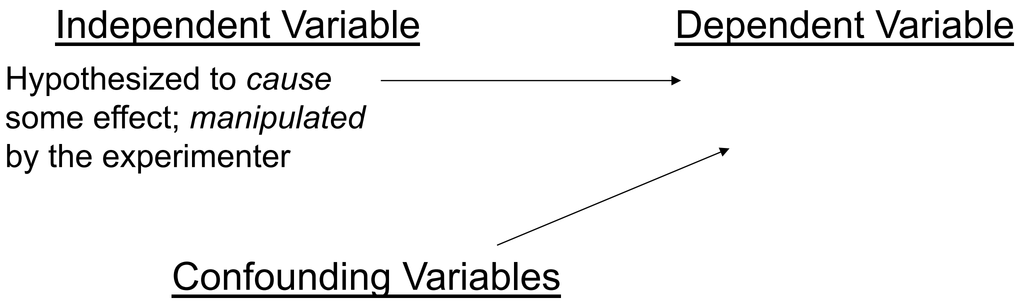
ADVANTAGES:
naturalistic setting and low interference
(Ecological validity)

DISADVANTAGES:
can get information about *correlations* but
cannot determine *causation*

EXPERIMENTATION

Manipulate some factor
(termed the independent variable).
Measure the effect on some other factor
(termed the dependent variable).
Keep everything else as similar as possible
(avoid confounding variables).

Experimental Design



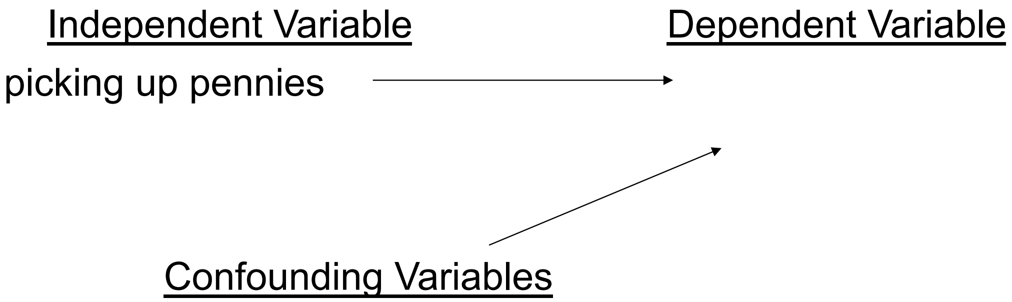
Independent Variable

Dependent Variable

Hypothesized to *cause*
some effect; *manipulated*
by the experimenter

Confounding Variables

Experimental Design



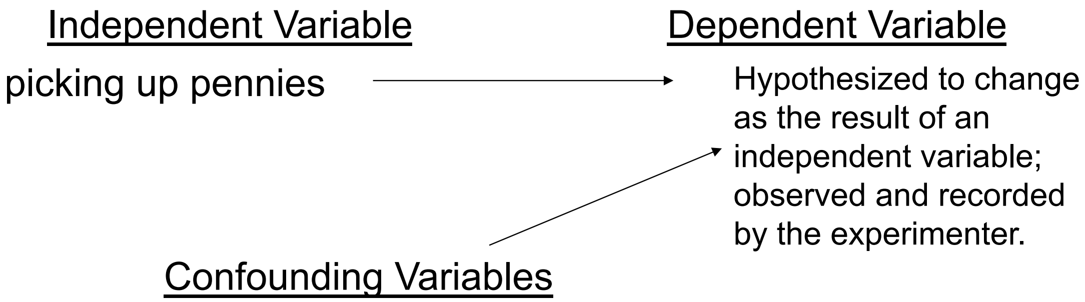
Independent Variable

picking up pennies

Dependent Variable

Confounding Variables

Experimental Design



Independent Variable

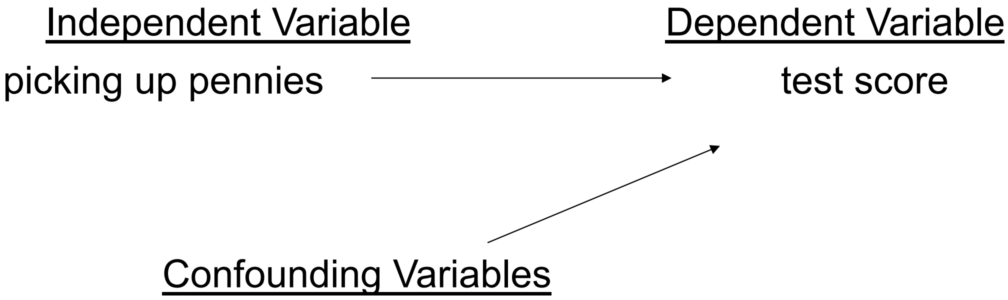
picking up pennies

Dependent Variable

Hypothesized to change
as the result of an
independent variable;
observed and recorded
by the experimenter.

Confounding Variables

Experimental Design



Independent Variable

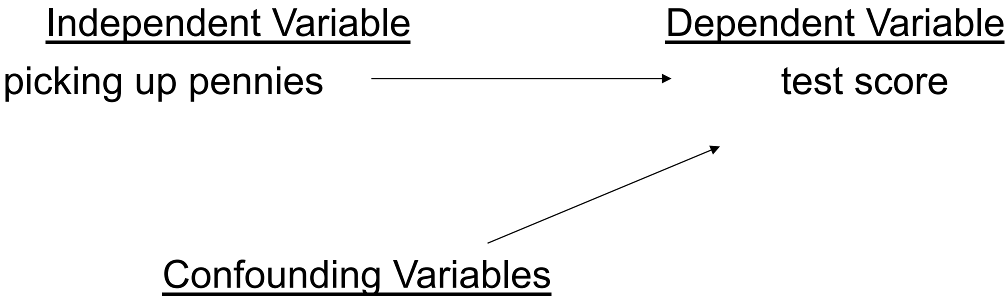
picking up pennies

Dependent Variable

test score

Confounding Variables

Experimental Design



Independent Variable

picking up pennies

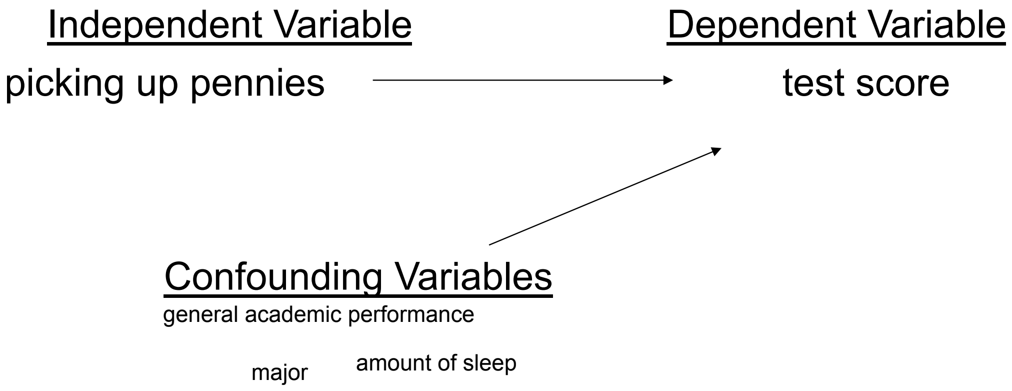
Dependent Variable

test score

Confounding Variables

Variables that are known (or suspected) to affect the dependent measure, but that are not of interest. May interfere with observation of the phenomenon of interest.

Experimental Design



Independent Variable

picking up pennies

Dependent Variable

test score

Confounding Variables

general academic performance

major

amount of sleep

EXPERIMENTATION

ADVANTAGES

- experimental control: you know what is affecting what

DISADVANTAGES

- demand characteristics
- generalizability

Experiments: Disadvantages

Demand characteristics: *just knowing you are in an experiment can change behavior*

- desire to impress experimenter
- to do a good job
- anxiety about performance

Experiments: Disadvantages

Generalizability: *experimental situations might be so artificial as to not to generalize to every-day life*

- behavior in the lab not the same as behavior outside of the lab

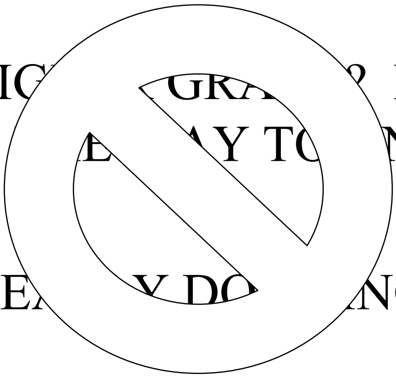
Pennies and luck: the experiment

Possible outcome

- Students who picked up pennies got, on average, higher grades on their exams.
- In the context of a controlled experiment, this supports a CAUSAL interpretation.

Headlines

- PEOPLE WHO PICK UP PENNIES EARN HIGHER GRADES!

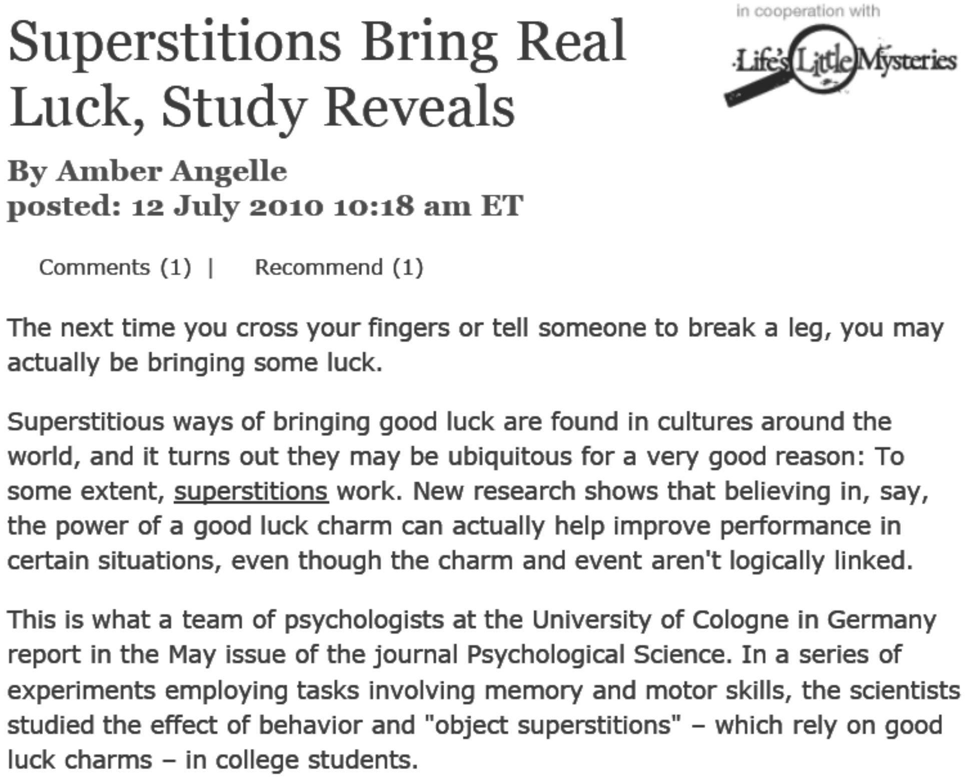


- WANT A HIG[illegible] GRA[illegible]? PICK UP A PENNY ON [illegible]E[illegible]AY TO[illegible]N EXAM!

- PENNIES REA[illegible]Y DO[illegible]NG LUCK! ?

Possible outcome

- Students who picked up pennies got, on average, higher grades on their exams.
- In the context of a controlled experiment, this supports a CAUSAL interpretation.
- BUT, may not be the specific causal mechanism we set out to investigate unless we have ruled out (*controlled for*) all other causes.



in cooperation with Life's Little Mysteries

Superstitions Bring Real Luck, Study Reveals

By Amber Angelle
posted: 12 July 2010 10:18 am ET

Comments (1) | Recommend (1)

The next time you cross your fingers or tell someone to break a leg, you may actually be bringing some luck.

Superstitious ways of bringing good luck are found in cultures around the world, and it turns out they may be ubiquitous for a very good reason: To some extent, superstitions work. New research shows that believing in, say, the power of a good luck charm can actually help improve performance in certain situations, even though the charm and event aren't logically linked.

This is what a team of psychologists at the University of Cologne in Germany report in the May issue of the journal Psychological Science. In a series of experiments employing tasks involving memory and motor skills, the scientists studied the effect of behavior and "object superstitions" – which rely on good luck charms – in college students.

Following up

- If picking up a penny improved exam performance by making students happier or more confident, maybe this only works for people who believe that picking up a penny causes good luck.
- Divide students into two groups: those who believe and do not believe the proverb.

Overall pattern

- Picked up penny: 75%
- Did not pick up penny: 65%

Effects of single variable (without considering the other) are known as “main effects.”

Can also look at “interactions” – is effect of one variable *consistent* across manipulations of the other variable?

Overall pattern

- Picked up penny: 75%
- Did not pick up penny: 65%

If the second variable (believing in the proverb or not) has NO effect, expect that grades in each subgroup are the same (NO INTERACTION).

- PUP: believers: 74.5%, nonbelievers: 75.5%
- NoPUP: believers: 65.3%, nonbelievers: 64.7%

INTERACTION

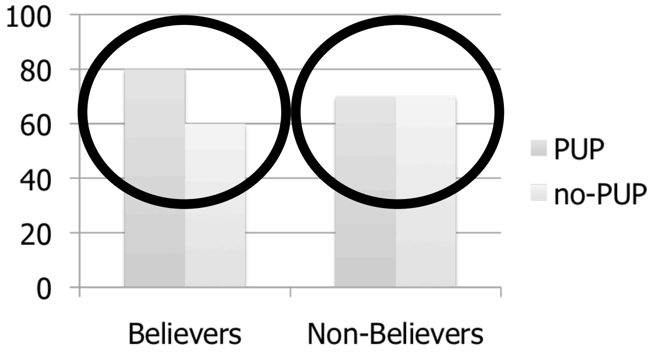
- Picked up penny: 75%
- Did not pick up penny: 65%

	Believers	Non-believers	Total
PUP	80%	70%	75%
No-PUP	60%	70%	65%
Total	70%	70%	

Experimental Design

- “Variables”
  - Whether you picked up a penny
  - Belief
- “Levels”
  - Penny: PICKED UP vs. DIDN’T PICK UP
  - Belief: BELIEVE vs. DON’T BELIEVE

INTERACTION: VISUALIZED



We can’t talk about the PUP effect without knowing whether the subject is a believer.

>> An **interaction** is when the effect of one variable **depends** on the level of the other variable.

Headlines

- PEOPLE WHO PICK UP PENNIES EARN HIGHER GRADES!
- WANT A HIGHER GRADE? PICK UP A PENNY ON THE WAY TO AN EXAM!

(assuming you believe that pennies bring luck)

- PENNIES REALLY DO BRING LUCK! **?**

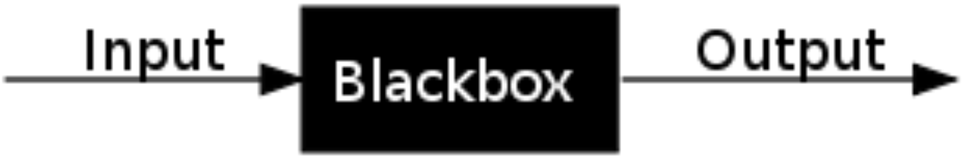
Follow up …

- Measure luck differently:
    - Example: does picking up a penny make you win more money from a slot machine?

- High school student Mark Levin tested whether having a black cat cross your path caused bad luck by looking at coin tosses.

Theories

- The mind as a "black box":



- Theories are current working descriptions of what might be going on in the black box.

Experimental Design

Independent variable →

- causes some effect
- manipulated by the experimenter

Dependent variable

- expected to change
- measured by experimenter

Pick up penny (or not)

Training condition →

Task difficulty

Exam Score

Response time (RT)

Eye movements

Response Times

LIVING OR NONLIVING?

TIME →

Input

Output

Response Times

LIVING OR NONLIVING?

TIME

Input

Output

Response Times

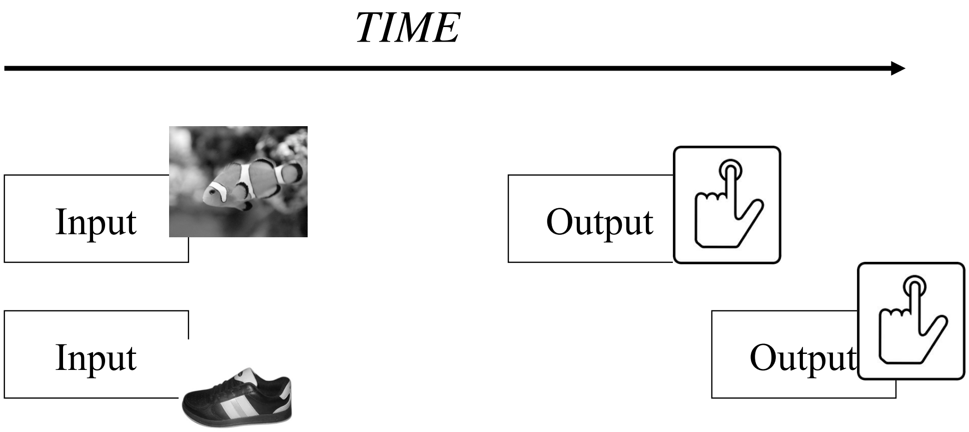
LIVING OR NONLIVING?

TIME

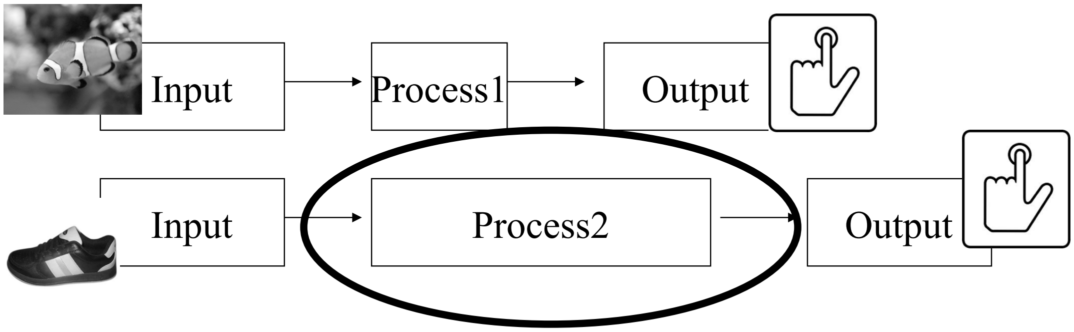
Input

Output

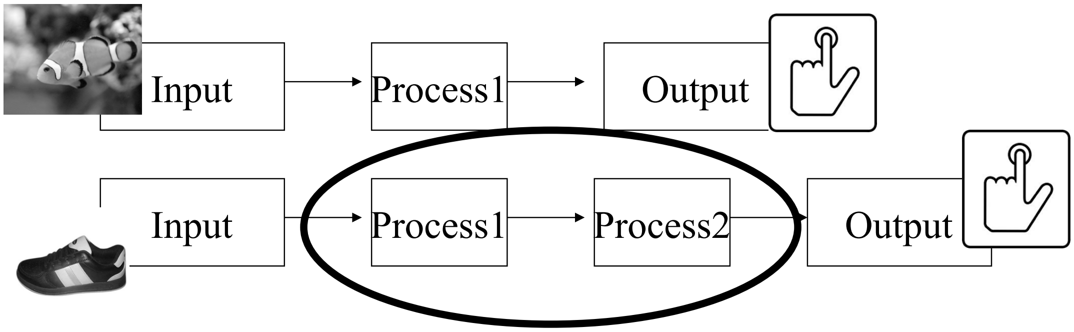
Response Times



Response Times



Response Times

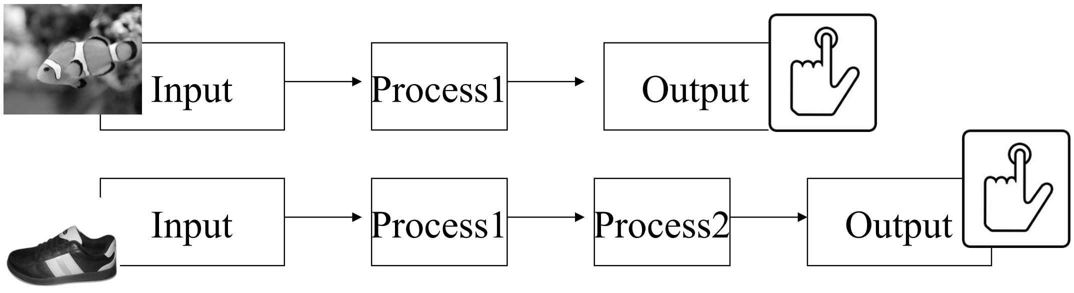


Input → Process1 → Output

Input → Process1 → Process2 → Output

Response Times

Time provides information about the identity and/or number of processes involved.



Input → Process1 → Output

Input → Process1 → Process2 → Output

Beyond Response Times

Psychophysiological measures

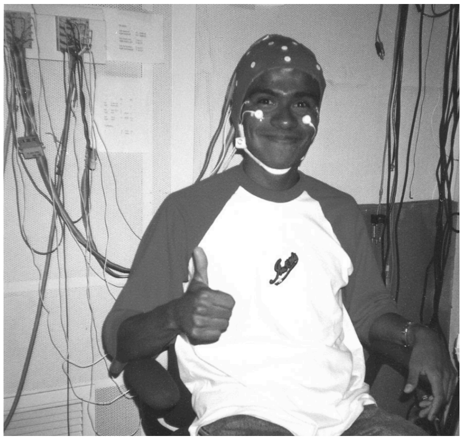
Eye movements

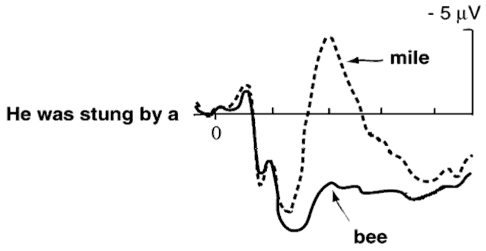
Other muscle activity (e.g., in facial muscles)

Autonomic measures:

- Pupil size
- Heart rate, blood pressure
- Sweat (“galvanic skin response”)

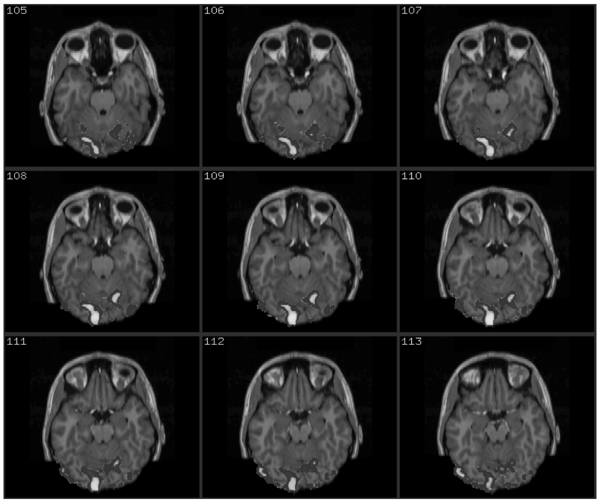
BrAiN WaVes



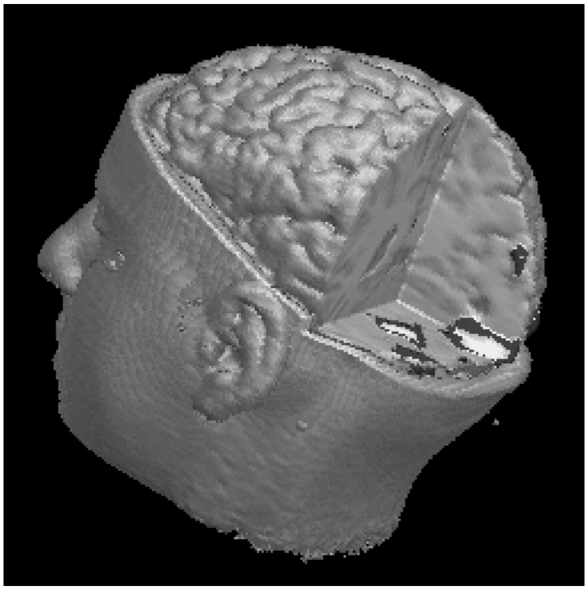

- 5 μV
mile
He was stung by a
0
bee

Measure on-going electrical activity from the brain (EEG).
Provides very accurate timing.

Magnetic Resonance Imaging (MRI)



Functional MRI (fMRI)



Good spatial information.

Poor timing information.

Can tell us if two processes are similar or different.

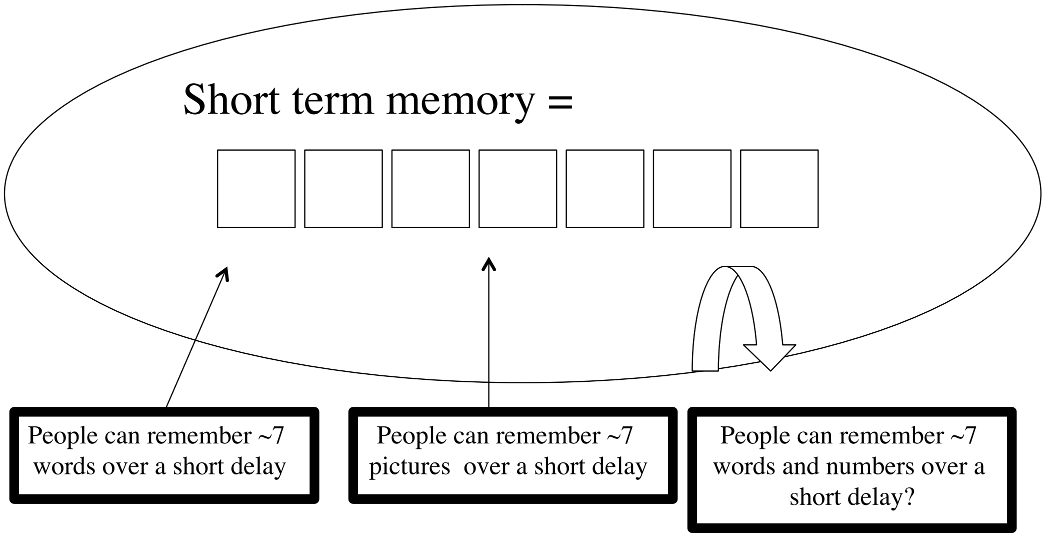
Neuropsychology

- Examine performance of patients with naturally-occurring brain damage
- If patients perform poorly on a cognitive task, assume damaged tissue is normally involved in that task.
- Like response times, can tell us if two processes are similar or different and how information flows through the system.

Interplay between data and theory

- Accumulating data suggests a more general picture of what might be happening.
- Theory = current working description of process or set of processes.
- Theories make predictions, which are tested with new experiments.
- New data helps refine theory.

Example



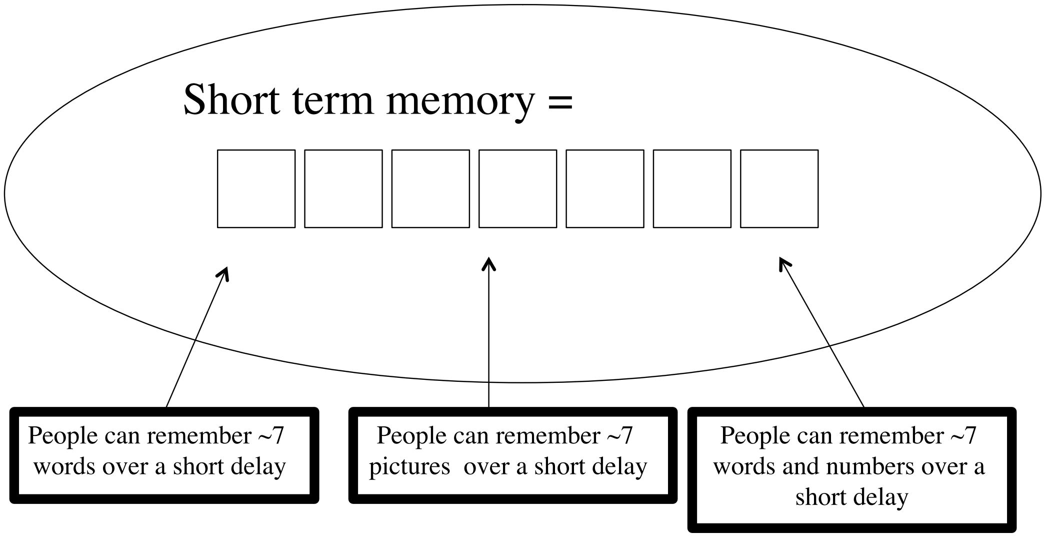
Short term memory =

People can remember ~7 words over a short delay

People can remember ~7 pictures over a short delay

People can remember ~7 words and numbers over a short delay?

Example



Short term memory =

People can remember ~7 words over a short delay

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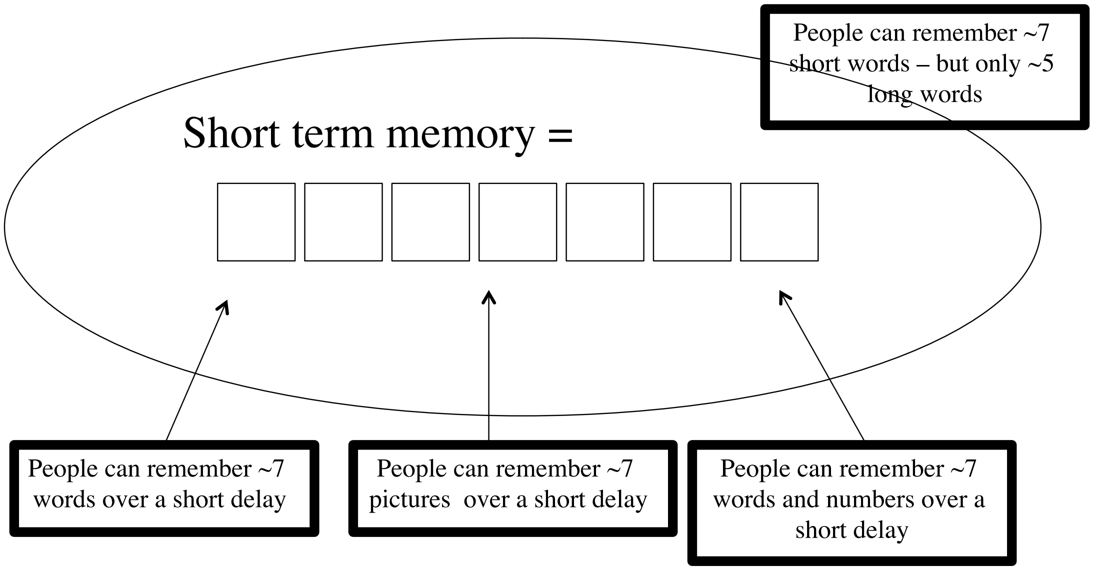
Properties of theories

- We have more confidence in a theory when it can explain a lot of data and makes accurate predictions.
- But theories can never be “proven”; in fact, theories HAVE to be falsifiable.

Einstein: “No amount of experimentation can ever prove me right; a single experiment can prove me wrong.”

Example



People can remember ~7 short words – but only ~5 long words

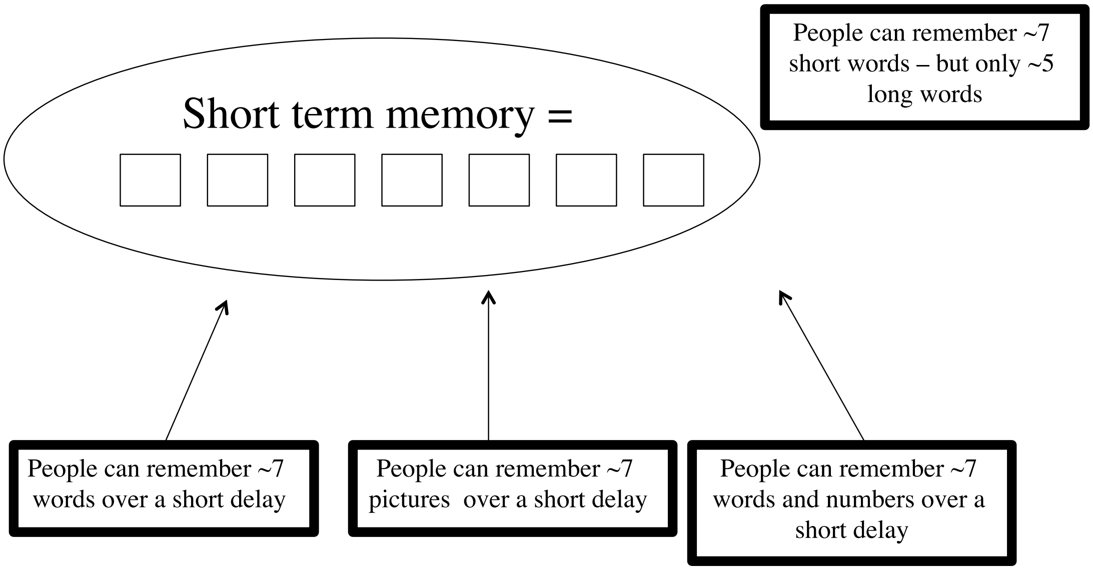
Short term memory =

People can remember ~7 words over a short delay

People can remember ~7 pictures over a short delay

People can remember ~7 words and numbers over a short delay

Example



Short term memory =

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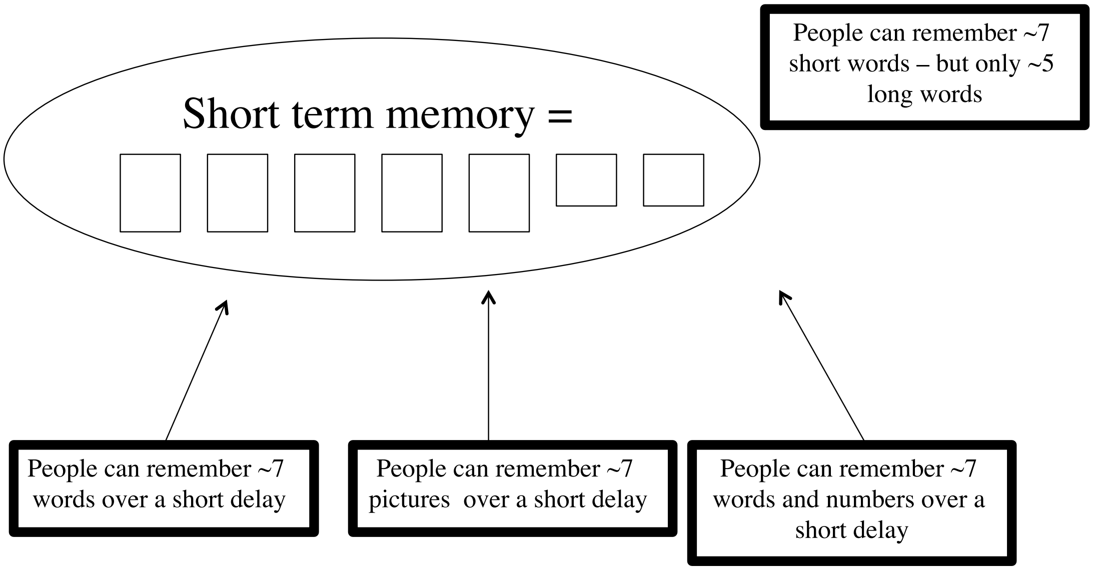

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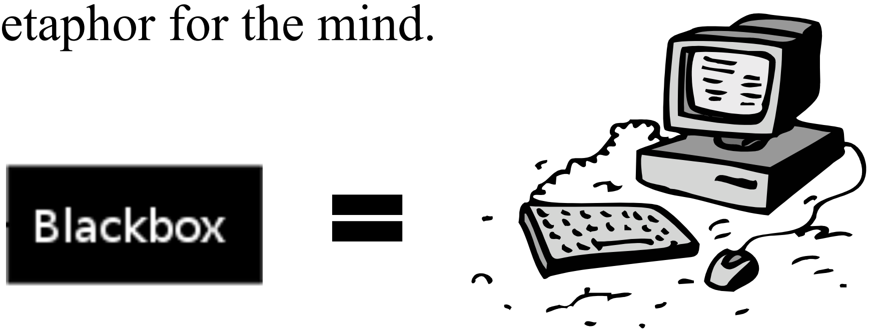
Information processing (IP)

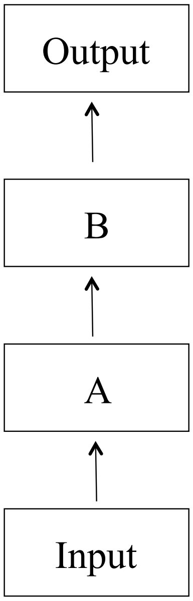
Many classic theories in cognitive psychology derive from the information processing tradition, which uses the digital computer as a metaphor for the mind.



What are computers like?

- have multiple internal systems
- process in stages
- can follow information flow over time and space (information is “discrete”)

Example IP Model

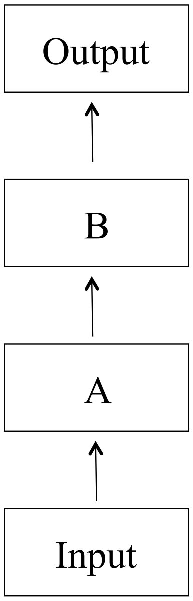


IP models often shown in the form of a "flowchart".

Arrows indicate flow of information.

"Bottom-up Processing"
- Starts from the input ("bottom")
- Moves "up" through the system

Example IP Model



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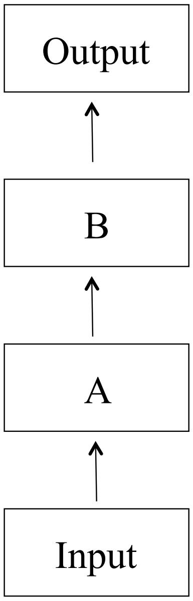

Output

B

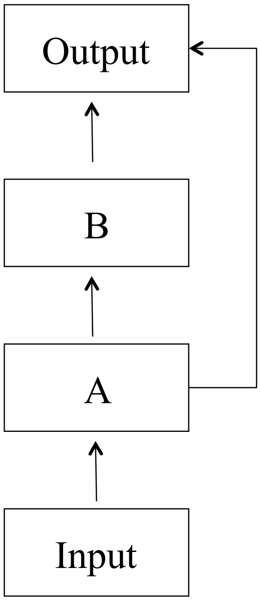
A

Input

Thinking about the model

- How many stages?
- How are the stages arranged?
- What would you expect to observe if there were damage to Stage A?
- What about damage to Stage B?

Example IP Model


Output

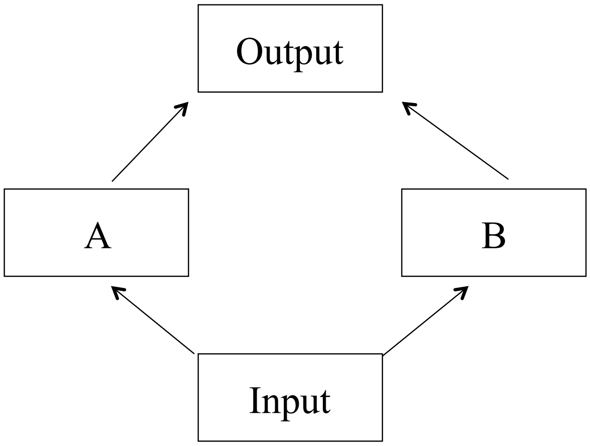
B

A

Input

What if the model were updated to look like this?

Another Example



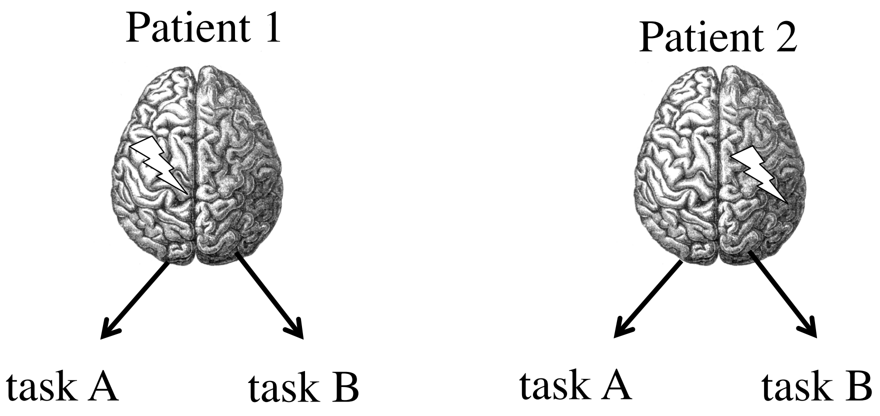
Double Dissociation

Now what would you expect to observe if there were damage to Stage A? to Stage B?

Double dissociations

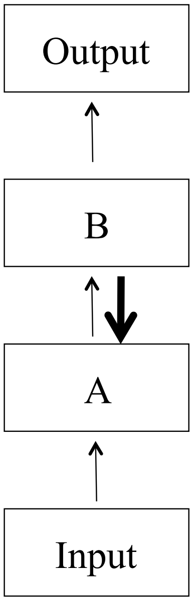
- If have separable cognitive processes:
  - Patient 1 can perform task A (which uses cognitive process A) but not B
  - Patient 2 (with different brain damage) can perform task B (which uses cognitive process B) but not A.

Double dissociations



- Why is it critical to find BOTH patients 1 and 2 (as opposed to just one)?

Top down processing



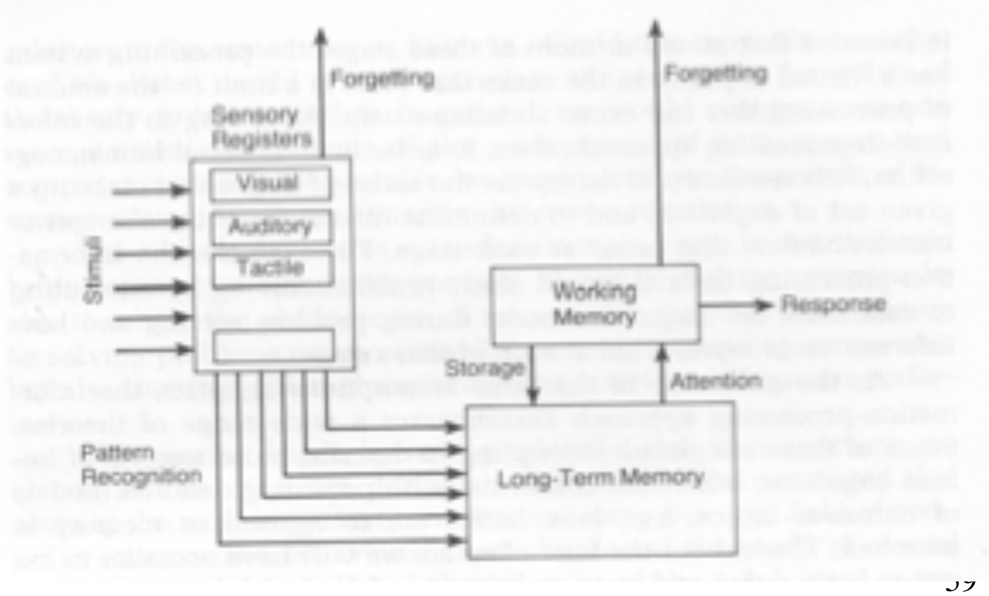
What would it mean to add this to the model?

“Top-down processing”

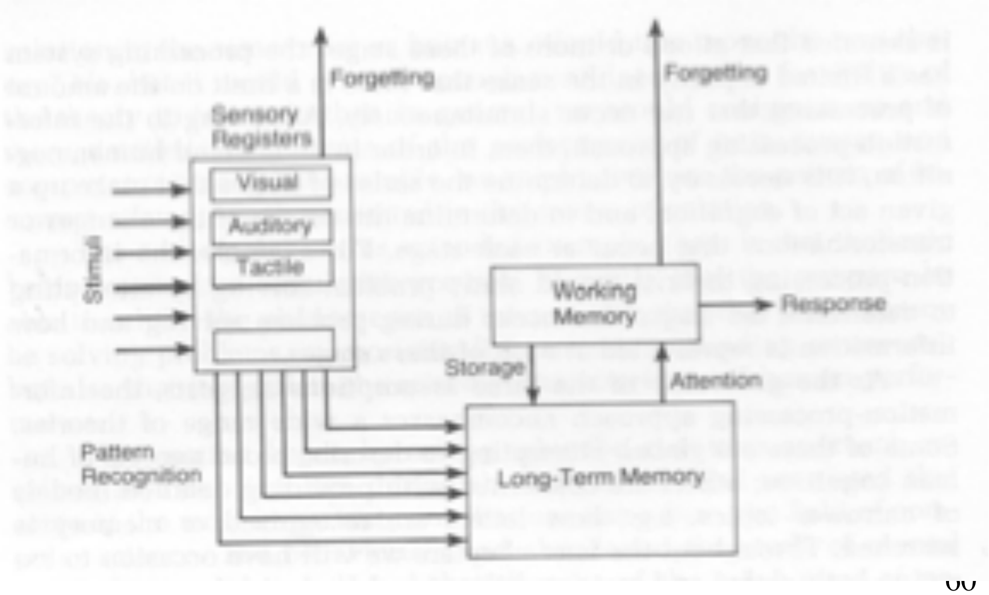
–“Higher” cognition influences stages of processing coming from the input.

–Processing of input now affected by memory, expectation, context

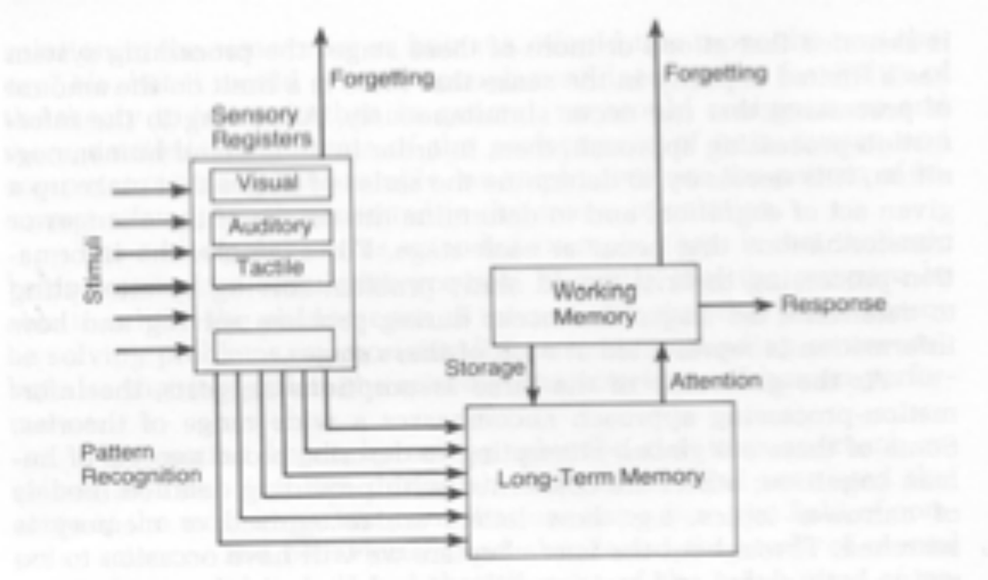
A classic IP model, with many subsystems



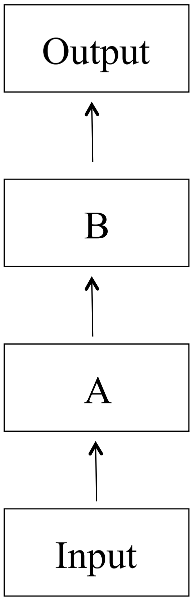
What stages lie between stimuli and response in this model?



Are there top-down influences from long-term memory onto perception in this model?



IP models: recap



Output

B

A

Input

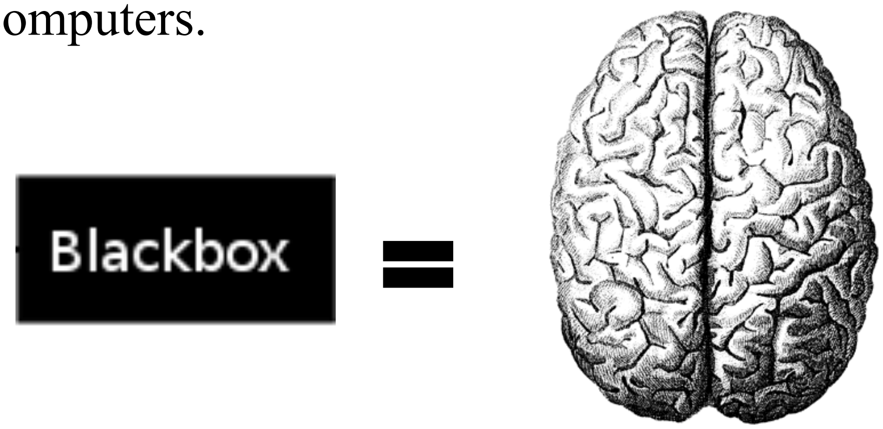
Inspired by digital computers

Information flows through serial “stages” of processing

Often emphasis on bottom-up processing

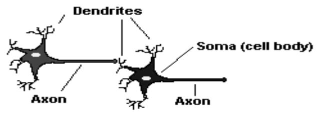
Parallel distributed processing (PDP)

Also known as “connectionism”. Emphasizes ways in which brains are different than computers.



What are brains like?

- lots of units, connected together

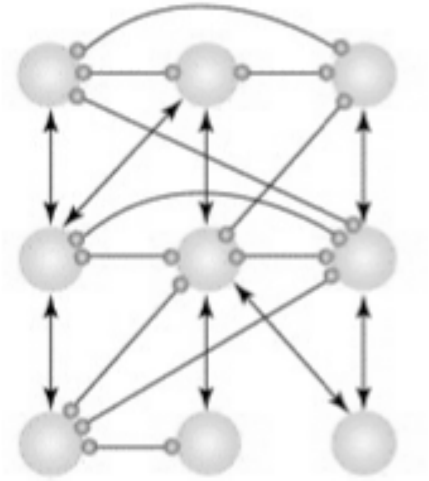


- many units send signals at the same time (“parallel processing”)
- (almost) always “top-down” as well as “bottom-up” connections, which are active at the same time

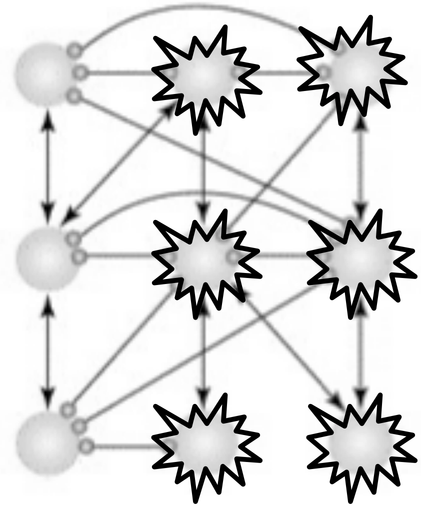
PDP/Connectionist Networks

- simple “units” that are off or on and are connected to one another with different strengths
- units become active in parallel
- information continuously flows throughout network, in both bottom-up and top-down directions

Example connectionist network



Example connectionist network



- A critical aspect of the PDP approach is that functions are “emergent”

http://www.metacafe.com/watch/70763/budweiser_stadium_2006_superbowl_commercial/

What does emergent mean?

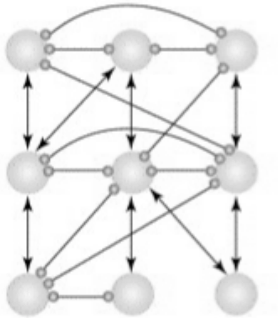
- each unit contributes a small, (by itself) meaningless part
- information emerges from the behavior of the whole set of units

PDP models: recap

Inspired by the brain.

Large numbers of simple units work in parallel, with continuous bottom-up and top-down activations.

Functions emerge from activity across the whole network.



Thought Question

Imagine that you have an IP and a PDP model of the same cognitive process.

What will happen (that is, how will the model behave) if you damage one “box” of the IP model?

What about if you damage one or more units (circles) of the PDP model?

Which is more like the human case?